

CHAPTER 2 NEC (2011) ARTICLES 220-230

SCOPE - SERVICE CONDUCTORS AND EQUIPMENT

This chapter covers service conductors and equipment for the control and protection of services and their installation requirements.

Number of services.

One- and two-family dwellings shall be supplied by only one service.

One building or other structure not to be supplied through another.

Service conductors supplying a building or other structure shall not pass through the interior of another building or other structure.

Other conductors in raceway or cable.

Conductors other than service conductors shall not be installed in the same service raceway or service cable.

Exceptions:

1. Grounding conductors and bonding jumpers.
 2. Load management control conductors having overcurrent protection.
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Service disconnect required.

Means shall be provided to disconnect all conductors in a building or other structure from the service entrance conductors.

Marking of service equipment and disconnects.

Service disconnects shall be permanently marked as a service disconnect.

Service disconnect location.

The service disconnecting means shall be installed at a readily accessible location either outside of a building or inside nearest the point of entrance of the service conductors. Service disconnecting means shall not be installed in bathrooms. Each occupant shall have access to the disconnect serving the dwelling unit in which they reside.

Maximum number of disconnects.

The service disconnecting means shall consist of not more than six switches or six circuit breakers mounted in a single enclosure or in a group of separate enclosures.

SERVICE SIZE AND RATING

Ampacity of ungrounded conductors.

Ungrounded service conductors shall have an ampacity of not less than the load served. For one-family dwellings, the ampacity of the ungrounded conductors shall be not less than 100 amperes, 3 wire. For all other installations, the ampacity of the ungrounded conductors shall be not less than 60 amperes.

Service load.

The minimum load for ungrounded service conductors and service devices that serve 100 percent of the dwelling unit load shall be computed in accordance with the following Table.

MINIMUM SERVICE LOAD CALCULATION

LOADS AND PROCEDURE
3 volt-amperes per square foot of floor area for general lighting and general use receptacle outlets.
Plus
1,500 volt-amperes multiplied by total number of 20-ampere-rated small appliance and laundry circuits.
Plus
The nameplate volt-ampere rating of all fastened-in-place, permanently connected or dedicated circuit-supplied appliances such as ranges, ovens, cooking units, clothes dryers not connected to the laundry branch circuit and water heaters.
Apply the following demand factors to the above subtotal:
The minimum subtotal for the loads above shall be 100 percent of the first 10,000 volt-amperes of the sum of the above loads plus 40 percent of any portion of the sum that is in excess of 10,000 volt-amperes.
Plus the largest of the following:
One-hundred percent of the nameplate rating(s) of the air-conditioning and cooling equipment.
One hundred percent of the nameplate rating(s) of the heat pump where a heat pump is used without any supplemental electric heating.
One-hundred percent of the nameplate rating of the electric thermal storage and other heating systems where the usual load is expected to be continuous at the full nameplate value. Systems qualifying under this selection shall not be figured under any other category in this table.
One-hundred percent of nameplate rating of the heat pump compressor and sixty-five percent of the supplemental electric heating load for central electric space-heating

systems. If the heat pump compressor is prevented from operating at the same time as the supplementary heat, the compressor load does not need to be added to the supplementary heat load for the total central electric space-heating load.

Sixty-five percent of nameplate rating(s) of electric space-heating units if less than four separately controlled units.

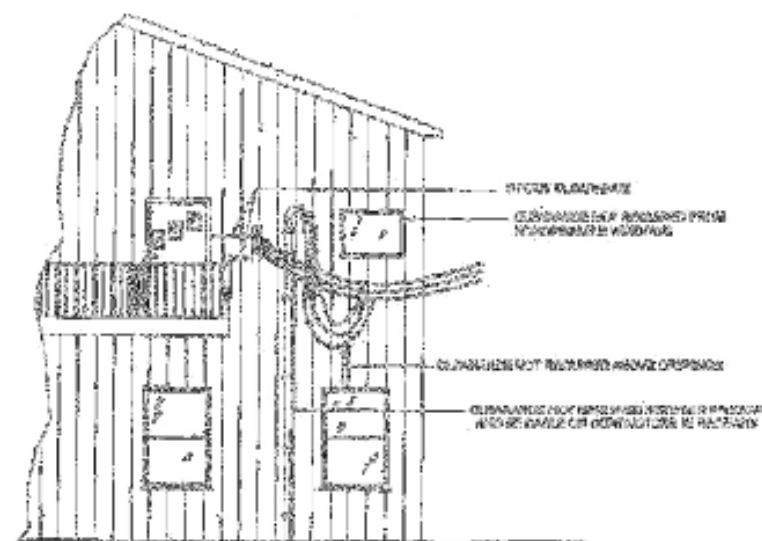
Forty percent of nameplate rating(s) of electric space-heating units of four or more separately controlled units.

**The minimum total load in amperes shall be the
volt-ampere sum calculated above divided by 240 volts.**

OVERHEAD SERVICE AND SERVICE-ENTRANCE CONDUCTOR INSTALLATION

Clearances on buildings.

Open conductors and multiconductor cables without an overall outer jacket shall have a clearance of not less than 3 feet (914 mm) from the sides of doors, porches, decks, stairs, ladders, fire escapes and balconies, and from the sides and bottom of windows that open.



Vertical clearances.

Overhead service conductors shall not have ready access.

Above roofs.

Conductors shall have a vertical clearance of not less than 8 feet (2438 mm) above the roof surface. The vertical clearance above the roof level shall be maintained for a distance of not less than 3 feet (914 mm) in all directions from the edge of the roof.

Exceptions:

- Where the roof has a slope of 4 inches (102 mm) in 12 inches (305 mm), or greater, the minimum clearance shall be 3 feet (914 mm).
- The minimum clearance above only the overhanging portion of the roof shall not be less than 18 inches (457 mm) where not more than 6 feet (1829 mm) of overhead service conductor length passes

over 4 feet (1219 mm) or less of roof surface measured horizontally and such conductors are terminated at a through-the-roof raceway or approved support.

4. The requirement for maintaining the vertical clearance for a distance of 3 feet (914 mm) from the edge of the roof shall not apply to the final conductor span where the service drop is attached to the side of a building.

5. Where the voltage between conductors does not exceed 300 and the roof area is guarded or isolated, a reduction in clearance to 3 feet (914 mm) shall be permitted.

Vertical clearance from grade.

Overhead service conductors shall have the following minimum clearances from final grade:

1. For conductors supported on and cabled together with a grounded bare messenger wire, the minimum vertical clearance shall be 10 feet (3048 mm) at the electric service entrance to buildings, at the lowest point of the drip loop of the building electric entrance, and above areas or sidewalks accessed by pedestrians only. Such clearance shall be measured from final grade or other accessible surfaces.

2. Twelve feet (3658 mm)—over residential property and driveways.

3. Eighteen feet (5486 mm)—over public streets, alleys, roads or parking areas subject to truck traffic.

Point of attachment.

The point of attachment of the service-drop conductors to a building or other structure shall provide the minimum clearances as specified in Sections E3604.1 through E3604.2.2. In no case shall the point of attachment be less than 10 feet (3048 mm) above finished grade.

Means of attachment.

Multiconductor cables used for overhead service conductors shall be attached to buildings or other structures by fittings approved for the purpose.

Service masts as supports.

Where a service mast is used for the support of service-drop conductors, it shall be of adequate strength or be supported by braces or guys to withstand the strain imposed by the service drop. Where raceway-type service masts are used, all equipment shall be approved. Only power service drop conductors shall be permitted to be attached to a service mast.

Supports over buildings.

Service conductors passing over a roof shall be securely supported. Where practicable, such supports shall be independent of the building.

Insulation of service-entrance conductors.

Service-entrance conductors entering or on the exterior of buildings or other structures shall be

insulated.

Exceptions:

1. A copper grounded conductor shall not be required to be insulated where it is:
 - 1.1. In a raceway or part of a service cable assembly,
 - 1.2. Directly buried in soil of suitable condition, or
 - 1.3. Part of a cable assembly listed for direct burial without regard to soil conditions.
 2. An aluminum or copper-clad aluminum grounded conductor shall not be required to be insulated where part of a cable or where identified for direct burial or utilization in underground raceways.
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Wiring methods for services.

Service-entrance wiring methods shall be installed in accordance with the applicable requirements.

Spliced conductors.

Service-entrance conductors shall be permitted to be spliced or tapped. Splices shall be made in enclosures or, if directly buried, with listed underground splice kits.

Protection of underground service entrance conductors.

Underground service-entrance conductors shall be protected against physical damage.

Protection of all other service cables.

Above-ground service-entrance cables, where subject to physical damage, shall be protected by one or more of the following: rigid metal conduit, intermediate metal conduit, Schedule 80 PVC conduit, electrical metallic tubing or other approved means.

Locations exposed to direct sunlight.

Insulated conductors and cables used where exposed to direct rays of the sun shall comply with one of the following:

1. The conductors and cables shall be listed, or listed and marked, as being sunlight resistant.
 2. The conductors and cables are covered with insulating material, such as tape or sleeving, that is listed, or listed and marked, as being sunlight resistant.
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Mounting supports.

Service-entrance cables shall be supported by straps or other approved means within 12 inches (305 mm) of every service head, gooseneck or connection to a raceway or enclosure and at intervals not exceeding 30 inches (762 mm).

Raceways to drain.

Where exposed to the weather, raceways enclosing service-entrance conductors shall be suitable for use in wet locations and arranged to drain. Where embedded in masonry, raceways shall be arranged to drain.

Rain-tight service head.

Service raceways shall be equipped with a service head at the point of connection to service-drop or overhead conductors. The service head shall be listed for use in wet locations.

Service cable, service head or gooseneck.

Service-entrance cable shall be equipped with a service head or shall be formed into a gooseneck in an approved manner. The service head shall be listed for use in wet locations.

Service-head location.

Service heads, and goosenecks in service-entrance cables, shall be located above the point of attachment of the service-drop or overhead service conductors to the building or other structure.

Exception: Where it is impracticable to locate the service head or gooseneck above the point of attachment, the service head or gooseneck location shall be not more than 24 inches (610 mm) from the point of attachment.

Drip loops.

Drip loops shall be formed on individual conductors. To prevent the entrance of moisture, service-entrance conductors shall be connected to the service-drop or overhead conductors either below the level of the service head or below the level of the termination of the service-entrance cable sheath.

Conductor arrangement.

Service-entrance and overhead service conductors shall be arranged so that water will not enter service raceways or equipment.

Secured.

Service-entrance cables shall be held securely in place.